AN INTRODUCTION TO LETTER COMBINATORICS.

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SUBJECT MATTER

(Combinatorial Computing)

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This is a subject matter in its first publication at the above institution. Any omitting or errors are mine only and can be communicated to when needed.

1INTRODUCTION

Letter combinatorics is about sentences or phrases and counting problems. It is logical structured and involves discrete operations like subtraction, addition and multiplication. It is about alphanumeric labeling of sentences or phrases and proofing of combinatorial enumerations. This teaches the theory of combinatorics of sentences or phrases or words called Letter Combinatorics (LC) with the 8-bulletin requirements. A Marriage Problem(MP) made up of 5 sentences are used in the exploit of letter combinatorics.A generating function is calculated for MP to handle constraints of arrangement/selection and the combinatorial enumerations of MP are also calculated. This example of letter combinatorics shows the calculation of addition , multiplication and subtraction principles of MP. This teaches the theory of combinatorics of sentences or phrases or words called Letter Combinatorics (LC). A

Letter Marriage Problem (LMP) set is used in the exploit of letter combina-torics. This example of letter combinatorics shows the calculation of addition, multiplication and subtraction principles of LMP. The second theory of LC is Moon-Sun-Go problem. Three problems will be look at in this document.

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1.1 Letter Combinatorics Requirement

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1.Letter Combinatorics has or must have the following requirements:

A countable number of sentences or phrases.

Counting the size of selected phrases for likely occurrence of subset equality of letters is called count.

A sentence with the number of letters specified is called Π.

The logical structure of arithmetic such as +, - and = should be applied.

Discrete operations must include count, addition, subtraction and sizes.

The sizes of selected phrases are enumerated.

Proofs with the discrete operations on which the enumeration of sizes stops.

There is a possibility of summation equal to Π.

*2.(**Count Equality Principle**) Definition:*

The size of selected phrases for likely occurrence of subset equality of letters.

An r-combination of n distinct objects is an unordered selection, or subset of r out of the n objects (letters). The fundamental skills of combinatorial reasoning on letter combinatorics is simply a class of counting problems.

Count Equality *is a principle of solution of specific classes of counting problem with no arrangement but selection with repetition.*

The two main counting principles in the elements of classes of counting problem are *addition* and *multiplication* principles.

3.Addition Principle states that if there are different objects in the first set,r1 different objects in the second set,r2 ...,rm and different objects in the mth set, and if the different sets are disjoint, then the number of ways to select an object from one of the mth sets is r1 + r2 + r3 + ...rm.

On the other hand, Multiplication Principle supposes a procedure can be broken into successive (ordered) stages with r1 different outcomes in the first stage, r2 different outcomes in the second stage, …, and rm different outcomes in the mth stage. If the number of

outcomes at each stage is independent of the choices in previous stages and if the composite out-comes are all distinct, the total procedure has different r1xr2xr3...rm composite outcomes.

4. A distribution problem is equivalent to an arrangement or selection problem with repetition. The focus on modeling distribution problems can be broken into sub-cases that can be counted in terms of simple permutation and combinations. The process of distributing r identical letter objects into n different letter objects is the selection equivalence of distribution.

Selection Equivalence of Letter Distribution*[SELD]* *(Corollary 1): The distributions of identical letter objects(word) are equivalent to letter selections.*

Distributing of distinct letter objects are equivalent to arrangements but letter combinations do not have that as a generally specialized distribution problem.

*1.(**Letter Count Problem**) Theorem: Letter combinatorics is a counting problem.*
*2.(**Letter Cut**) Lemma: A selected phrase is by cutting a number of possible letters.*

Finally, it is a counting problem and a selected phrase is by cutting a number of possible letters.

> *1.(**Cutting Strategy**) Proposition:*
> *A strategy of cutting the possible matches can continue with as many comparisons as needed.*
>
> *2.(**Π-Sentence**) Axiom: Π is a number of letters specified in a sentence.*

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1.2 MARRIAGE PROBLEM (EXAMPLE 1)

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(1) Damn it.

(2) What's wrong?

(3) It is a combination of 46 letters.

(4) Akua will not marry you.

(5) Pokua will not marry you.

1. Partition of Integers (Definition): A partition of countable integer, count to be a collection of positive integers whose sum is N.

2. For the Marriage Problem(MP) Example, the partition of integers are:

Damn		it.			(1)
4	+	2	=	N	= 6.
Whats		wrong			(2)
5	+	5	=	N	= 10.

3. The collection or set of a sum and the list of integers of the partition is in increasing order.

MP = { 6, 10 }, MP set is a set of marriage problem partitions of integers.

Letter Marriage Problem is a sentential summation operated by subtraction on minimum and maximum values given as LMPSet={6, 10, 14, 19, 20, 27}. LMPSet is union of RMPSet1 and sum(MP6).

A discrete operation about another discrete operation is a discrete meta-operation. It seems that there is only one discrete operation in the logical structure for some cases. This is not the case, the count of sentence or size of letters/word is all based on additive operation. sum(L4, s) is a perfect discrete meta-operation that uses both subtraction and addition operations.

The sentence for 4 states:

(4)Akua will not marry you.

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2.0 MOON-SUN-GO PROBLEM (EXAMPLE 2)

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(1) Go away

(2) Go away moon

(3) Go away moon-sun

(4) The sun is go away thing

(5) The moon is go away thing

(6) The sun and moon goes upto the sky । The sun and moon go upto the skies

For the MOON-SUN-GO Problem(MSGP) Example, the partition of integers are:

Go away (1)
2 + 4 = N = 6.
Go away moon (2)
2 + 4 + 4 = N = 10.
The sun is go away thing (4)

$3 + 3 + 2 + 2 + 4 + 5 = N = 19$

MP={6,10,19}, MP set is a set of MOON-SUN-GO problem partitions of integers. The MOON-SUN-GO problem and MARRIAGE problem are the same partition of integers.

Different problems with different word or sentence structures. This is *Appiah Test*.

Appiah Test: *The test of possible outcomes of sentence system yielding same partition of integers to one of the problems- MOON-SUN-GO problem and MARRIAGE problem.*

Appiah Complete Information:

A letter combinatorial solution is complete in a sentence system if and only if there is a partition of integers of members to the set that equals {6, 10, 14, 19, 20, 27} or one of Appiah Test SubSet.

{6,10,19,20}, *{6,10,14,19,20}* and *{6,10,14,19,20,27}* are

Appiah Test SubSet.

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3.0 FAMILY-VISION PROBLEM (EXAMPLE 3)

##

(1) At home | Family

(2) We are close

(3) We live in a house

(4) We are family business

(5) It has family set in home

(6) We have family computer in a home

For the FAMILY-VISION Problem(FVP) Example, the partition of integers are:

We are close (2)
2 + 3 + 5 = N = 10.
We live in a house (3)
2 + 4 + 2 +1+ 5 = N = 14.
We are family business (4)

2 + 3 + 6 + 8 =N =19.

FAMILY-VISION PROBLEM passes Appiah Test.

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4.0 RESEARCH FINDINGS

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The discrete subtraction operation of LMP is the same to the real marriage problem (RMP) is the first research finding. The meta-operation of LMP is the second research finding based on the determination of all counts of LC on LMPset. The research finding is based on the introduction of discrete subtraction operation on the minimum and maximum summations in LC of RMP. Finally, Appiah Test and Appiah Complete Information are the main research findings.

APPENDIX A- Size Graphics Illustration

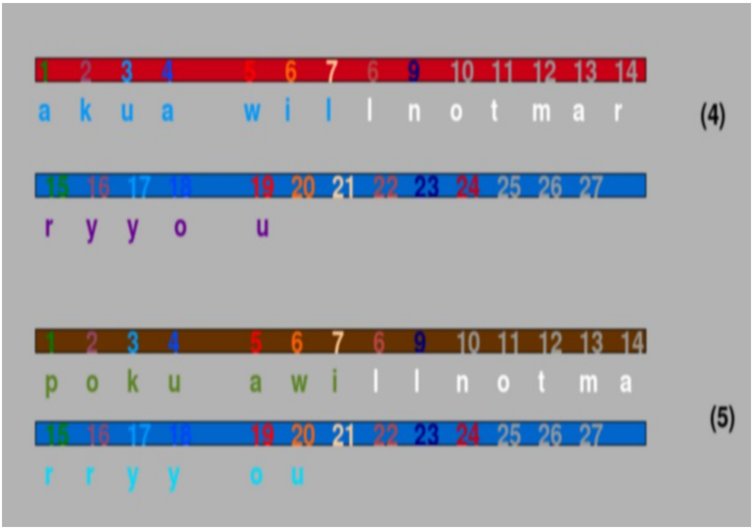
Illustration 1: Sentence (1) Size Graphics

Illustration 2: Sentence (2) Size Graphics

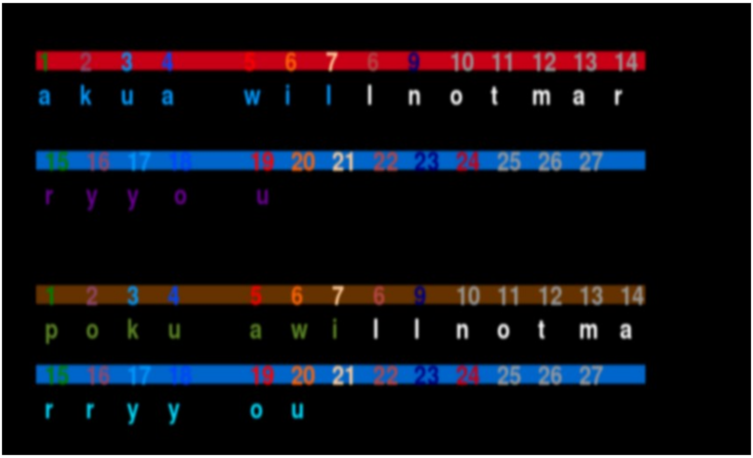
Illustration 3: Sentence (3) Size Graphics

Illustration 4: Sentence (4) Size Graphics

Illustration 5: Sentence (5) Size Graphics


1 2 3 4 5 6 7 8 9 10 11 12 13 14
a k u a w i l l n o t m a r
(4)
15 16 17 18 19 20 21 22 23 24 25 26 27
r y y o u
1 2 3 4 5 6 7 8 9 10 11 12 13 14
p o k u a w i l l n o t m a
(5)
15 16 17 18 19 20 21 22 23 24 25 26 27
r r y y o u


1 2 3 4 5 6
D a m n i t
1 2 3 4 5 6 7 8 9 10
W h a t ' s w r o n g
1 2 3 4 5 6 7 8 9 10 11 12 13 14
i t i s a c o m b i n a t i
15 16 17 18 19 20 21 22 23 24 25 26 27
o n o f 4 6 l e t t e r s



1 2 3 4 5 6 7 6 9 10 11 12 13 14
a k u a w i l l n o t m a r
15 16 17 18 19 20 21 22 23 24 25 26 27
r y y o u
1 2 3 4 5 6 7 6 9 10 11 12 13 14
p o k u a w i l l n o t m a
15 16 17 18 19 20 21 22 23 24 25 26 27
r r y y o u

APPENDIX B- Table on Size, Position, Index and Words.

Marriage Problem Table

Index	*Position*	Word	Size
1	1	**Damn**	4
1	2	**it**	2
2	1	**What's**	5
2	2	**wrong**	5
3	1	**it**	2
3	2	**is**	2
3	3	**a**	1
3	4	**combination**	11
3	5	**of**	2
3	6	**46**	2
3	7	**letters**	7
4	1	**Akua**	4
4	2	**will**	4
4	3	**not**	3

Index	*Position*	Word	Size
4	4	**marry**	5
4	5	**you**	3
5	1	**Pokua**	5
5	2	**will**	4
5	3	**not**	3
5	4	**marry**	5
5	5	**you**	3

Moon-Sun-Go Problem Table

Index	*Position*	Word	Size
1	1	**Go**	2
1	2	**away**	4
2	1	**Go**	2
2	2	**away**	4
2	3	**moon**	4
3	1	**Go**	2
3	2	**away**	4

Index	*Position*	Word	Size
3	3	**moon**	4
3	4	**-**	1
3	5	**sun**	3
4	1	**The**	3
4	2	**sun**	3
4	3	**is**	2
4	4	**go**	2
4	5	**away**	4
4	6	**thing**	5
5	1	**The**	3
5	2	**moon**	4
5	3	**is**	2
5	4	**go**	2
5	5	**away**	4
6	1	**The**	3
6	2	**sun**	3
6	3	**and**	3
6	4	**moon**	4

Index	*Position*	Word	Size
6	5	**goes**	4
6	6	**upto**	4
6	7	**the**	3
6	8	**sky**	3

Family-Vision Problem Table

Index	*Position*	Word	Size
1	1	**At**	2
1	2	**home**	4
2	1	**We**	2
2	2	**are**	3
2	3	**home**	4
3	1	**We**	2
3	2	**live**	4
3	3	**in**	2
3	4	**a**	1

Index	*Position*	Word	Size
3	5	**house**	5
4	1	**We**	2
4	2	**are**	3
4	3	**family**	6
4	4	**business**	8
5	1	**It**	2
5	2	**has**	3
5	3	**family**	6
5	4	**set**	3
5	5	**in**	2
5	6	**home**	4
6	1	**We**	3
6	2	**have**	4
6	3	**family**	6
6	4	**computer**	8
6	5	**in**	2
6	6	**a**	1
6	7	**home**	4

Bibliography

1. *Alan Tucker(2012), Applied Combinatorics, Wiley, 6th Edition, ISBN:1118210115.*